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ABSTRACT

Decision flowcharts are efficient and effective training tools for librarians and library employees below the administrative level. In addition, the cost of training programs is reduced by the use of flowcharts. Training staff in the performance of routine procedures is particularly suited to the use o f decision flowcharts. The two types of flowcharts commonly used are the type that documents the conditions that must exist before a decision is reached and the type that documents a sequence of operations and decisions. Simplicity for ease of understanding is a requirement for both. Decision flowcharts are efficient because the trainee can learn complex tasks quickly. And, they are effective because they may be used to increase motivation and to reduce training time. (SJ)

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REPORT

No. 59

Decision Flowcharts as Training Tools
In Libraries

by

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Librarians are constantly being admonished to adopt some of the techniques developed in the fields of management science and applied mathematics in order to analyze operations and facilitate decision making. While the careful documentation of procedures and analysis of the total library system is clearly of value to the library administrator in his roles of change agent, or budgeteer, or decision maker, it is not so clear what value certain of these techniques have for those farther down the chain of command. To justify the use of flowcharts in documenting procedures, for example, it is frequently stated that the act of producing the chart will lead to insights as to how unnecessary steps may be identified and eliminated and how paper work may be decreased. The assumption is made that until one writes each step of a procedure in a rectangular box and each decision in a diamond that he never clearly sees what he is doing -- that the prime motivators in organizing tasks are habit and tradition and that reliance on habit and tradition is necessarily bad. It certainly is true that sometimes unnecessary operations are identified and paper work is eliminated when a procedure is flowcharted. It is also true that sometimes highly efficient or highly inefficient procedures are immortalized in flowcharts and no great insights are gained from the act of flowcharting. How then can one recommend the use of flowcharts to those who are not at the highest levels of library administration. One answer is that decision flowcharts are efficient and effective as training tools.

That the development of better training methods is not an unimportant activity can be shown by figures obtained by a survey made at the Wayne State University Libraries in October, 1971. It was found that 1.758 per cent of total staff time was spent in training activities. If training time was spread equally over all categories of employees, the cost would be approximately $48,000. However, since librarians devote 3.348 per cent of their time training other staff members, this figure is actually much lower than real costs.

Flowcharts are recommended as a means to reduce this cost because they have the following capabilities:

(1) They reduce the length of time that it takes the trainee to learn complex rules.

(2) They describe a routine in the same way that the trainee performs the routine.

(3) They permit the division of routines into manageable subroutines as well as provide an overview of total operations.

(4) They may be used as a motivational device by allowing the reorganization of jobs into "whole units of work" and by "vertical job loading".

(5) They may be written with little training in flowcharting.

(6) They are more easily revised than written procedures.

If one is willing to accept the contention that the use of decision flowcharts is suitable for training activities and that the use of this technique will reduce the high cost of teaching routine procedures to staff, there are still two questions that must be answered. First, what procedures can be described in this way and; second, how can this technique be adapted to suit this specific use?

In 1960, Herbert A. Simon distinguished two types of decisions: programmed decisions and nonprogrammed decisions. Programmed decisions are "...repetitive and routine, a definite procedure has been worked out for handling them so that they don't have to be treated de novo each time they occur". (1) Nonprogrammed decisions are those that are "novel, unstructured, and consequential". When dealing with nonprogrammed decisions, the system "...must fall back on whatever general capacity it has for intelligent, adaptive, problem-oriented action". (2) C. Edward Weber further defines routinized (programmed) decision making.

> The essential characteristic of routinized decision making is that the rules are specialized to handle a limited class of problems and that these specialized rules make the situation highly structured. Nonroutinized decision making (problem solving) uses general purpose rules rather than special purpose ones. (3)

Weber then describes the role of habit and tradition.

> [Routinized decision making] is an automatic consequence of preceding events in most cases. He [the manager] has internalized a set of rules that bring him to a predetermined outcome. The organizational manual of standard operating procedures and the organization structure itself are parts of these rules, and the manager conforms to them in most situations. (4)

Training staff in routine procedures is then seeing to it that they internalize ways of performing work (that is, that they develop desired habits) whether or not they receive their instruction from written procedures or by word of mouth. When procedures are documented in flowcharts, it is possible for those with little experience to grasp complex rules more quickly than if they rely on the gradual build up of experience or rely on lengthy verbal descriptions. And since it is possible to describe complex rules more clearly in this way, it is also possible to determine which of the decisions thought to be nonprogrammed and intuitive are actually programmed but not documented in a written form. Whenever a procedure is repeated frequently, it is likely that programmed decisions are involved regardless of whether or not the procedure includes many steps or is difficult to describe. As Weber notes, "Most decisions in organizations are routinized, since organizations can afford to be creative only at the margin". (5)

The Shiffman Medical Library is using flowcharts for the following functions: check-in of serials, claiming of serials, selection for binding, bindery preparation, processing of photoduplication requests, determination of whether a serial title should be treated as a classed monographic series or as an unclassed serial, temporary binding routine, and processing of standing order invoices for serials. In Scientific Management of Library Operations, a flowchart appears on pages 60 to 64 that was used "to aid a bibliographic staff in learning the processes of screening and searching when a book was physically available as contrasted to screening and searching when only an order card was available". (6)

Two types of flowcharts are being used at the Shiffman Library. The first is the type that documents the conditions that must exist before a decision is reached. The flowchart for determining whether a series should be treated as a monographic series or as an unclassed serial (Example A) and the flowchart for bindery selection are of this type. The second type is the flowchart that documents a sequence of operations and decisions. The flowchart for bindery preparation is of this type. (Example C)

Since the purpose of both types is to train someone to either do something or to decide something, the first requirement is that they be easily understood. To accomplish this, only a few symbols are used and each chart is written following the same conventions. Symbols are restricted to the process block; the decision diamond; the terminal, or start/stop; the on-page connector; the off-page connector and the comment. Since the purpose is not to show what array of equipment is required, or whether a file is being merged, or if an operation is manual, and

so on, there is nothing to be gained by using additional symbols. The desire for clarity (as well as increased comparability between departments) determines the conventions used.

The conventions used are that the sequence of operations moves from top to bottom and from left to right; flowlines do not cross or intersect; and diagonal flowlines are not used. When a loop is encountered, as in Figure 1A, a connector is used to continue the flow, as in Figure 1B.

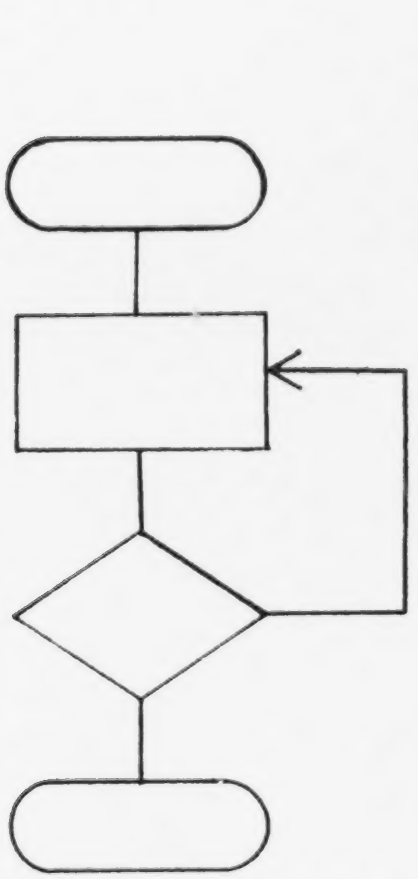


Figure 1A

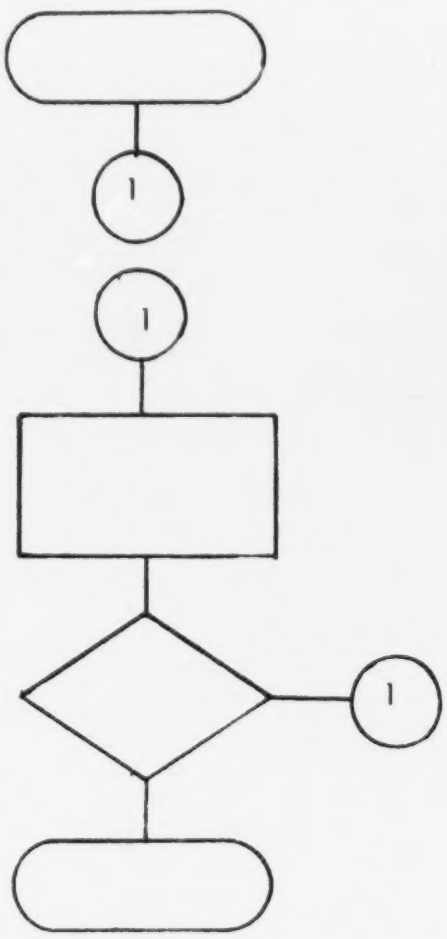


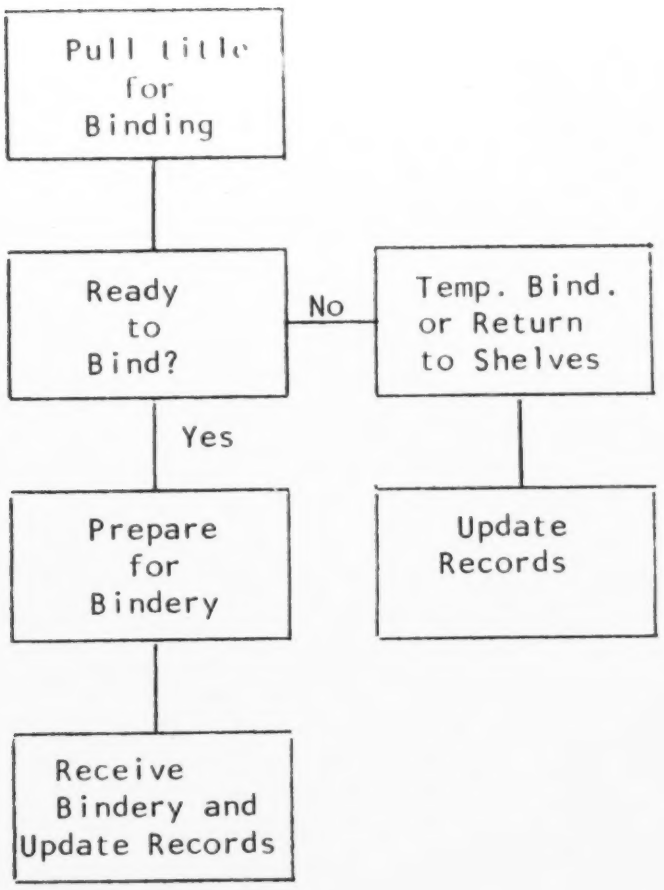
Figure 1B

While this might appear to complicate the chart, it is possible by this means to divide long procedures into manageable parts. The learner may, for example, perform all operations between points four and eight on a flowchart before he learns the entire operation. Writing these very simplified flowcharts doesn't require any knowledge of computers, programming or systems analysis. It does require knowledge as to how work is performed and willingness to go through the drudgery of listing every step of an operation.

When writing the first type flowchart, that is the type that documents conditions rather than a sequential flow of operations and decisions, it is presumed that the user already knows what operations would be performed and how to perform them. For example, the user of the flowchart in Example A knows the relevant sources to consult to determine whether or not a given serial is being indexed. This flowchart could have been produced in the form of a decision table as in Example B. However, with the large number of combinations of conditions that are involved, it becomes difficult to determine whether all combinations are represented in a table. Example A could also be written as a narrative description, but such a description would be extremely unwieldy. The only practical way of documenting how this decision is reached in this particular setting, rather than relying on a limited number of generally applied criteria such as periodicity, editorship, and so on, is by producing a document that actually reflects the way the decision maker habitually approaches the problem when the action to be taken is not clear cut.

This flowchart reflects the fact that in this particular setting unclassed serials do not circulate while classed series do. Access to serials is primarily through photocopy service but requests are accepted for only those articles that can be photocopied in thirty exposures or less. In this library, review-type serials are not circulated, unless the articles cannot be photocopied, regardless of their pattern of publication. Example A also reflects the likelihood of a title being indexed in the future by including periodicity and separate authorship of separate articles. Certainly there are enough conditions present which would influence the final decision so that it would take the learner a considerable time to master them. The approach used in writing this type flowchart is to list every condition that might influence the final decision. The list is then arranged in a logical sequence and the flowchart is written from this list.

When preparing to write the second type flowchart, the type that documents the sequence of operations as well as decisions, a block diagram may be drawn in order to select a manageable part of a procedure to flowchart. A block diagram to provide an overview of the bindery operation appears below. From this diagram, the procedures for determining whether the title is ready for binding, the procedures for preparing the title for binding, and the temporary binding routine were selected for flowcharting. The relatively simple procedure for updating records after the bindery shipment is returned was described in a written form. Next, all operations to be carried out and all decisions that might have to be made are listed. The list is then used as a mnemonic aid when writing the flowchart.



One value of the flowchart as a training aid is that it describes a routine in the same way that a person performs the routine. That is, the person gathers information, determines a course of action, then either makes a decision(s) or performs an operation(s). He then gathers more information, again determines a course of action, again makes a decision or performs an operation until he completes the total routine. When steps are irrelevant in a particular case, they are bypassed. Another value of the flowchart is that not only can operations be divided into manageable parts but they can be gathered into meaningful wholes.

Whenever tasks are divided into simple, highly routinized components, and the method for carrying out each of these components is highly structured, there is the danger of reducing the motivation of the worker performing the tasks. However, since it is possible to gather these tasks into meaningful wholes, it is also possible to reorganize task assignments so that this danger is eliminated and motivation is, in fact, increased.

In The Motivated Working Adult, Ray C. Hackman proposes a theory of job motivation. His theory depends on a view of the central nervous system as "an entity in its own right" with "the other systems in the body -- the muscular system, the circulatory system,

and the rest...its servants [which] aid and abet its need for survival". (7) He makes one basic assumption about this entity: "...its maintenance and development depend on the extent to which it receives stimulation". (8) Hackman notes that since the successful completion of a task (closure) reinforces motivation and since man seeks closure at ever-increasing levels of complexity, "it is reasonable to suggest that closure seeking is a natural function of this entity and serves to increase the stimulation potential of its psychological environment".(9) This definition contains a causal element, that is, stimulation seeking generates activity leading to the completion of ever-increasingly complex tasks. Successful completion of the tasks leads to further stimulation seeking. That is, stimulation seeking is self-reinforcing.

It was mentioned in this paper that by the use of flowcharts that make it possible to describe complex procedures, one is able to identify routines and decisions that are thought to be non-programmed and intuitive but which are actually programmed but not documented. This capability in turn makes it possible to load jobs vertically, that is to make the job more challenging by adding more difficult tasks to the job (as opposed to horizontal loading in which more tasks of the type already performed are added to the job). It also makes possible the assignment of whole units of work. (A whole unit of work may be defined as work that is organized as a unit and is performed by an individual -- as opposed to work in which separate tasks of a unit of work are assigned to various individuals.) That the organization of tasks into whole units of work is a powerful motivator is shown by experiments such as those carried out at the American Telephone and Telegraph Company and reported in Motivation Through the Work Itself.(10)

It is frequently noted that it is preferable to have those who perform work document that work so that actual routines are described. There is another practical reason that makes this desirable. It is far easier to teach subordinates to write these simplified decision flowcharts and to assist them in their charting than it is to learn all the minutia of someone else's job. It is also a compliment to that person to say, in effect, that they are performing their work so well and know their jobs so well that they are the ones best able to do the documentation. If the tasks being flowcharted are performed by the supervisor, it may be decided that the task -- now seen to be routinized -- should be assigned to a subordinate to vertically load the subordinate's job or to form a whole unit of work.

Decision flowcharts as training tools are, then, efficient because they allow the trainee to learn complex tasks quickly. And they are effective because they may be used to increase motivation and to reduce time spent on training thus allowing concentration on the real goals of the unit rather than on the means to achieve these goals.

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4. Weber, pp. 7-8.

5. Weber, p. 7.

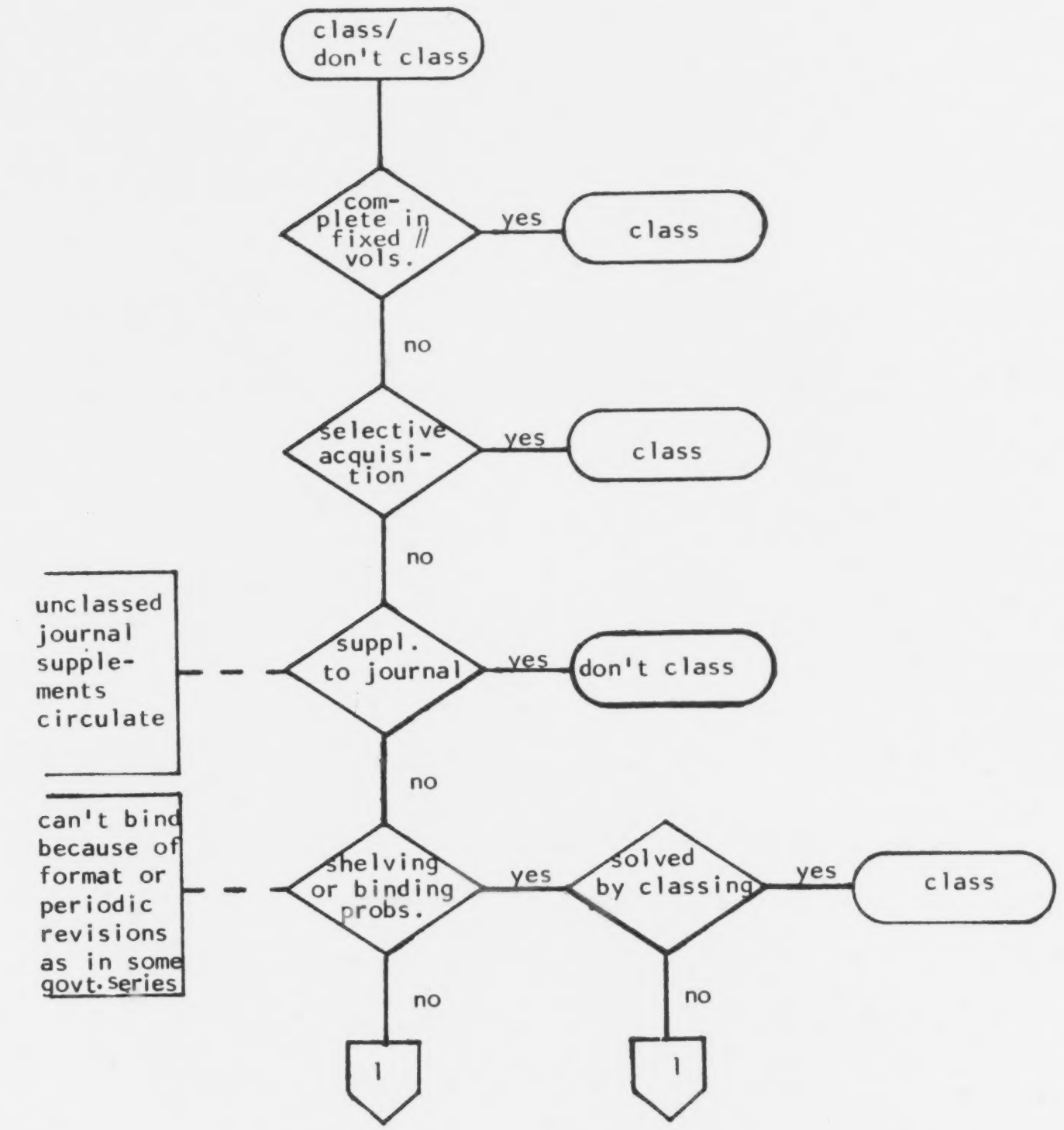
6. Richard M. Dougherty and Fred J. Heinritz, Scientific Management of Library Operation (New York, Scarecrow Press, 1966), p. 57.

7. Ray C. Hackman, The Motivated Working Adult (New York, American Management Association, 1969), p. 140.

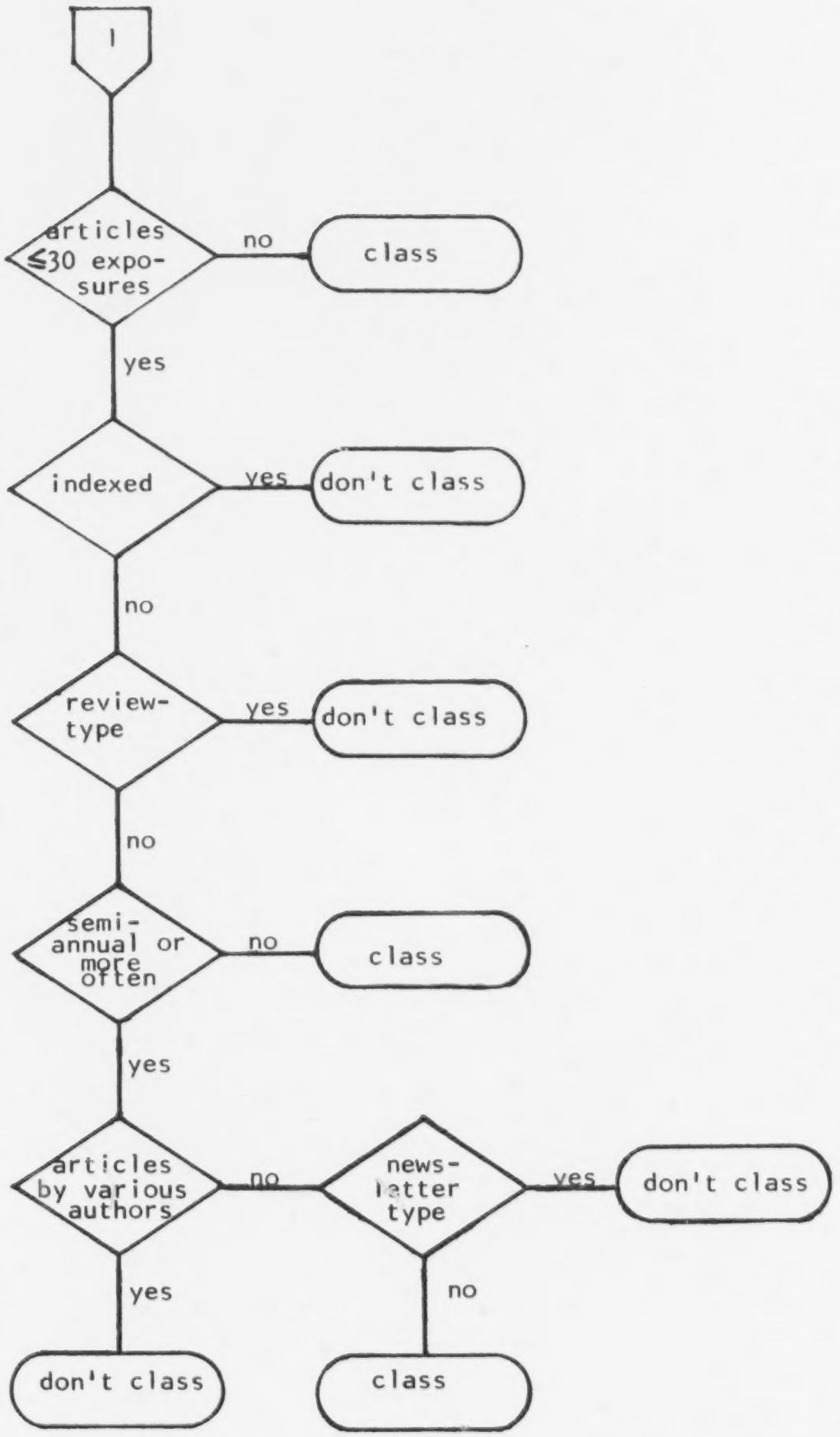
8. Loc.cit.

9. Hackman, p. 141.

10. Robert N. Ford, Motivation Through Work Itself (New York, York, American Management Association, 1969).



Example A-1
Chart drawn by Ruth Taylor and Carolyn Navarre


1
articles ≤30 expo-sures
no
class
yes
indexed
yes
don't class
no
review-type
yes
don't class
no
semi-annual or more often
no
class
yes
articles by various authors
no
news-letter type
yes
don't class
yes
no
don't class
class

Example A-2

Column numbers	1	2	3	4	5	6	7	8	9	10	11	12	ELSE
Complete in fixed # of vols	Y	N	N	N	N	N	N	N	N	N	N	N	
Acquired selectively		Y	N	N	N	N	N	N	N	N	N	N	
Supplement to a journal			Y	N	N	N	N	N	N	N	N	N	
Shelving or binding problems				Y	Y	N	N	N	N	N	N	N	
Such problems solved by classing				Y	N	-	-	-	-	-	-	-	
Articles less than or = to 30 exposures					N	N	Y	Y	Y	Y	Y	Y	
Indexed							Y	N	N	N	N	N	
Review type								Y	N	N	N	N	
Semiannual or more frequent									N	Y	Y	Y	
Articles by various authors										Y	N	N	
Newsletter type											Y	N	
Serial			X				X	X		X	X		
Classed series	X	X		X	X	X			X			X	
Investigate error													X

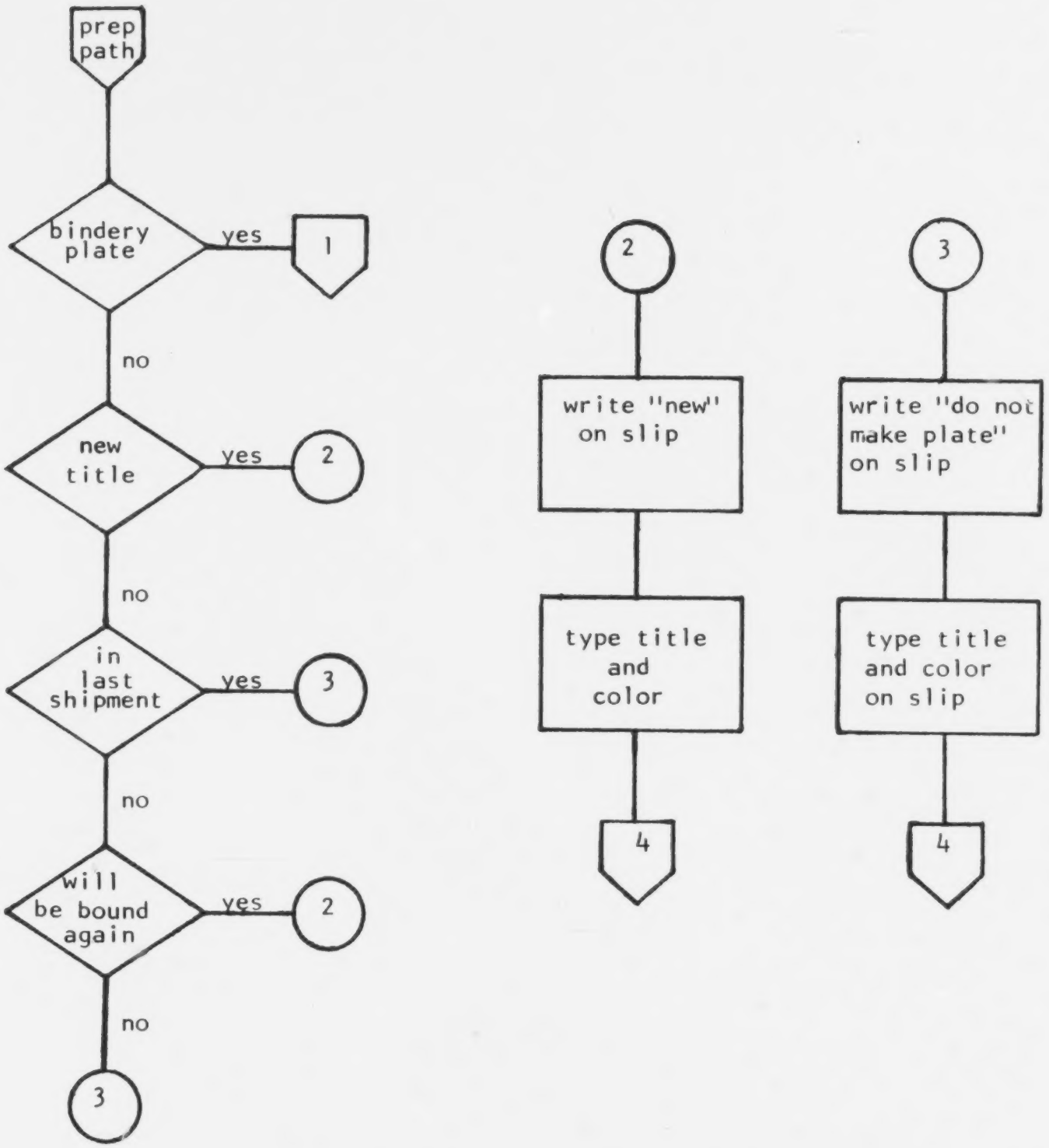
Y = yes

N = no

X = action to be taken

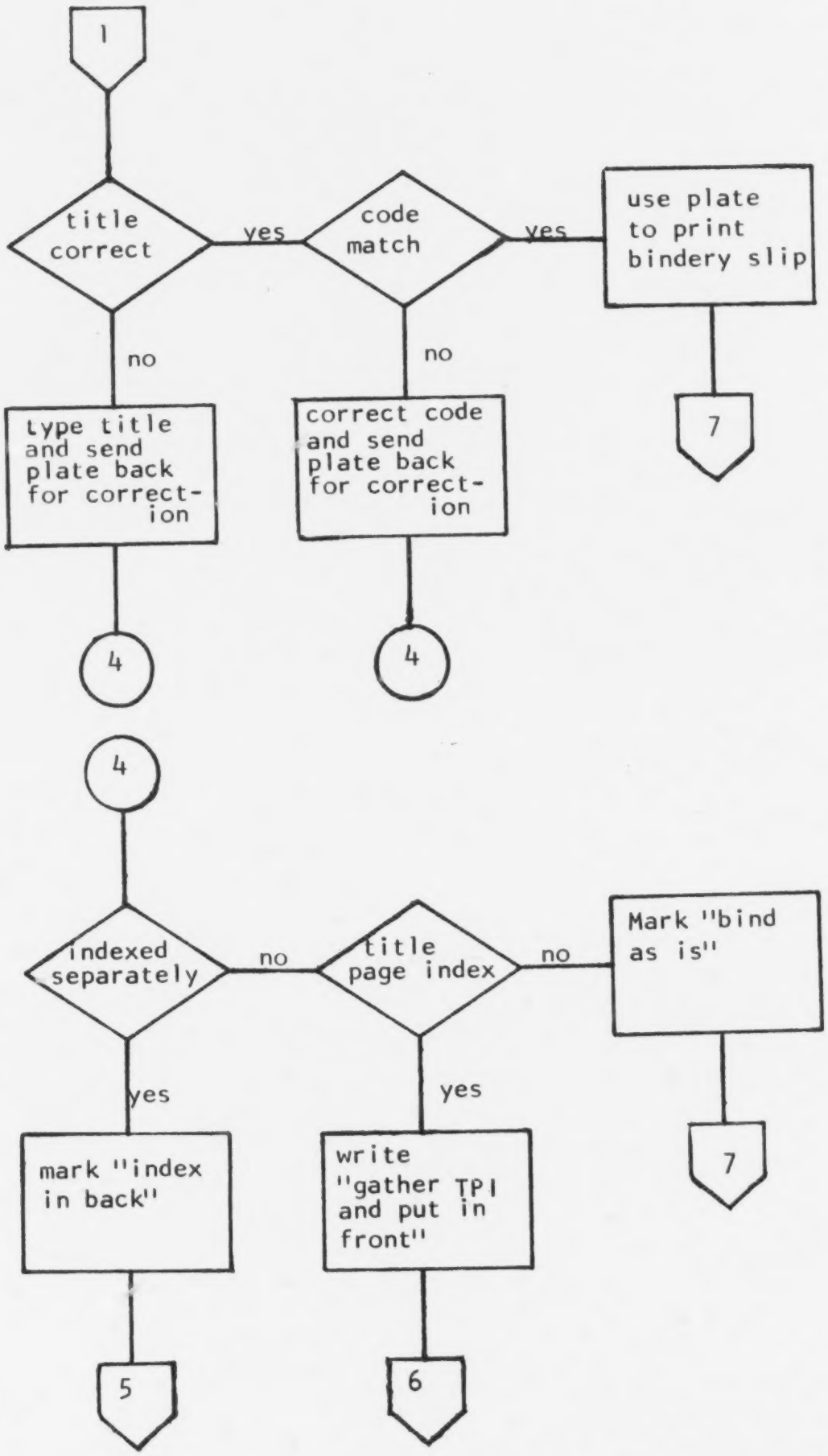
Table is read down the numbered columns

Example B

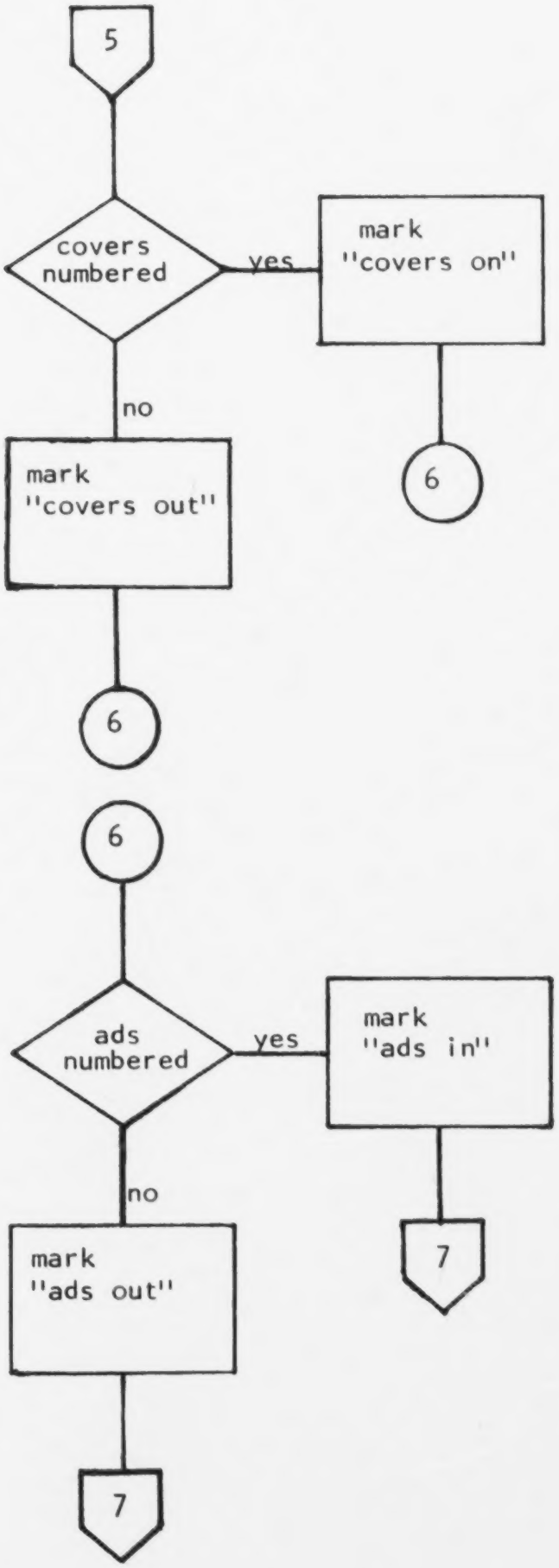


Example C-1 Bindery Preparation

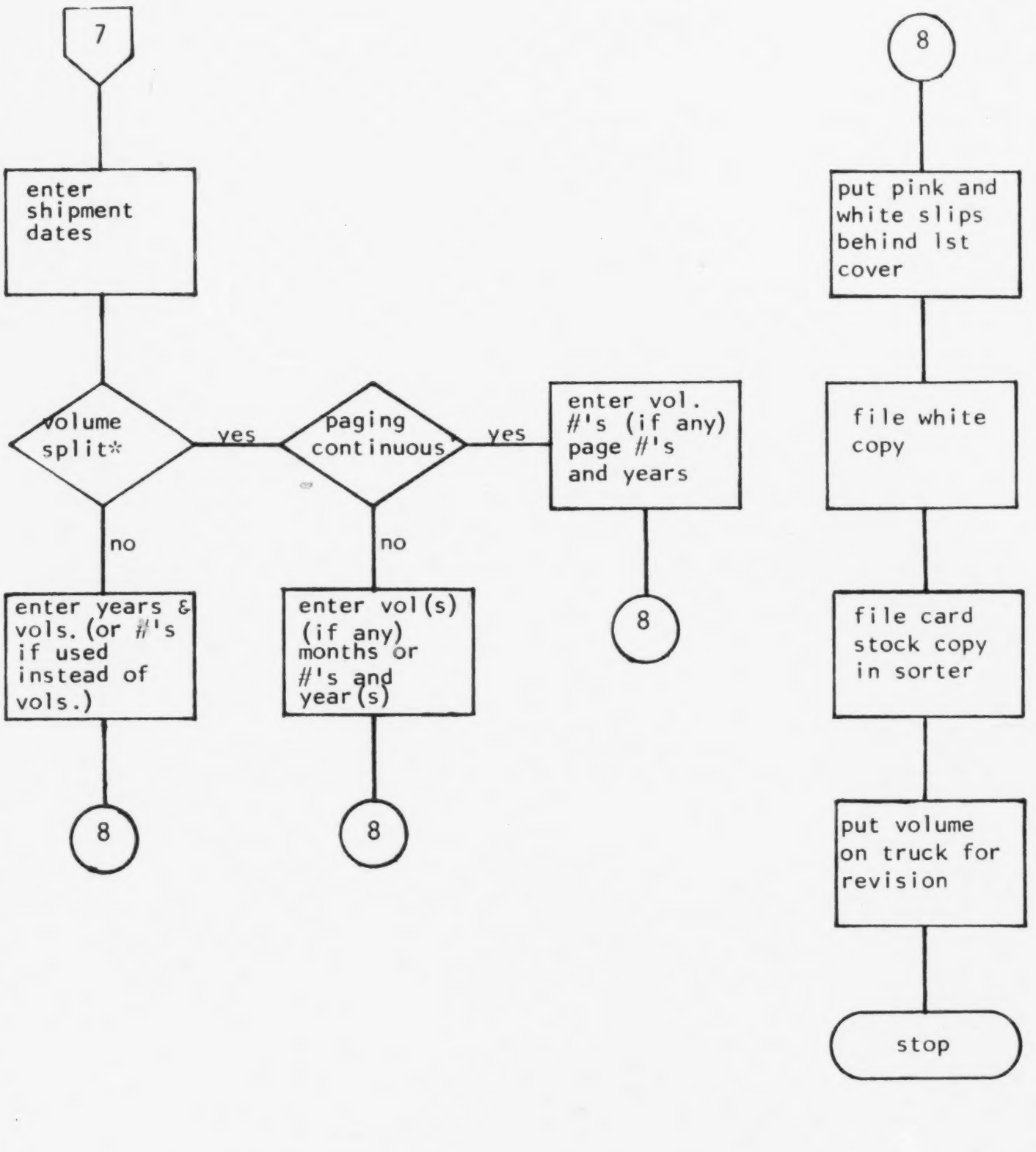
Chart drawn by Mary Ann Neal and Carolyn Navarre


1
title correct
yes
code match
yes
use plate to print bindery slip
no
no
type title and send plate back for correct-ion
correct code and send plate back for correct-ion
7
4
4
4
indexed separately
no
title page index
no
Mark "bind as is"
yes
yes
mark "index in back"
write "gather TPI and put in front"
7
5
6

Example C-2


5
covers numbered
yes
mark "covers on"
no
mark "covers out"
6
6
ads numbered
yes
mark "ads in"
no
mark "ads out"
7
7

Example C-3



Example C-4

* Instructions included as part of bindery selection flowchart